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EXAMINER	
BERDICHEVSKY, MIRIAM	
ART UNIT	**PAPER NUMBER**
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/579,226	BELLEVILLE ET AL.	
	Examiner	**Art Unit**	
	MIRIAM BERDICHEVSKY	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _14 November 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-9 and 11_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-9 and 11_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Remarks

Claims 1-9 and 11 are amended. Claim 10 is canceled. Claims 1-9 and 11 are currently pending.

Status of Rejections

All rejections from the previous office action are withdrawn in view of Applicant's amendments. New grounds of rejection are presented as necessitated by amendment.

Priority

1. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in France on 11/17/2003. It is noted, however, that applicant has not filed a certified copy and English translation of the FR 0350841 application as required by 35 U.S.C. 119(b). Therefore, Yanagida remains prior art under U.S.C. 35 102(a).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-2, 5-7, 9 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Ding (*"Nanofabrication of Organic/Inorganic Hybrids of TiO_2 with Substituted Phthalocyanine or Polythiophene"* as cited in the IDS).

As to claim 1, Ding teaches a method of preparing a pn—semiconductor material that can be obtained by the following steps:

- A step in which a substrate made of porous oxide ceramic (porous TiO_2 nanoparticles – section I, ¶ 2) is functionalized by chemical grafting of one or more compounds containing at least one group (carboxylic groups - section I, ¶ 3) that can be polymerized with one of more precursors of an electrically conducting polymer (PTAA - section I, ¶ 3) and at least one group able to be chemically grafted (covalent linkage - section I, ¶ 3) onto said substrate; and
- A step in which the substrate thus functionalized is impregnated with a solution containing an electrically conducting polymer (section 3.1.2., ¶ 1).

Ding is silent to a step in which the substrate thus functionalized being impregnated with a solution containing the precursor(s); and a step in which the precursor(s) are polymerized.

Zhao teaches a conventional chemical grafting method (grafting from) that requires the step of functionalizing the surface (I, initiators) and impregnating with a solution of precursors (M, monomers) which are then polymerized (Figure 9). Zhao

teaches that the advantage of using 'grafting from' rather than the method taught by Ding (grafting to) is that there is an increasing in grafting density, as taught by Zhao (page 693, section 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the 'grafting from' method of Zhao in Ding because 'grafting from' decreases the amount of steric hindrance because the precursor (monomers) are smaller molecules than polymers and can readily reach the substrate to link.

Regarding claims 2 and 5, Ding teaches that the ceramic is TiO_2 (section 1, ¶ 2).

Regarding claim 6, Ding teaches that the group able to be chemically grafted onto the ceramic is $COOR^1$ where R^1 represents a hydrogen atom (carboxylic groups) (section 1, ¶ 3).

Regarding claim 7, modified Ding teaches that the group chosen $COOR^1$ where R^1 represents a hydrogen atom can be polymerized with precursors (Zhao: see claim 1) of an electrically conducting polymer chosen group thiophene (PTAA) (Ding: section 1, ¶ 3).

Regarding claim 9, modified Ding teaches that the porous oxide ceramic substrate is TiO_2 chemically grafted by thiophene-3-acetic acid (if the polymer directly bonds to the substrate then the link between the substrate and the polymer less one unit will be a monomer of the polymer which is thiophene-3-acetic acid) to an alkylthiophene (remainder of the PTAA) (Figure 1). Therefore, in the event of using 'graft from' the first linkage between a monomer and the porous oxide will provide the

functionalization with the required formula followed by polymerization with the remainder of the monomers, alkylthiophenes to produce grafted PTAA.

As discussed above in relation to claim 1, it would have been obvious to one of ordinary skill in the art to use “graft from” because ‘grafting from’ decreases the amount of steric hindrance because the precursor (monomers) are smaller molecules than polymers and can readily reach the substrate to link (Zhao).

Regarding claim 11, modified Ding teaches the use of the pn-semiconductor material comprising a porous metal oxide ceramic chemically grafted to an electrically conducting polymer grafted thereto for use in a solar cells (section 1, ¶ 1), but is silent to the pn-semiconductor material being between the electrodes.

It would have been obvious to one of ordinary skill in the art to at the time of the invention to place the pn-semiconductor material between a first and second electrode in the solar cell because otherwise the solar cell would not function.

5. Claims 1-3, 5-9 and 11 are rejected under 35 U.S.C. 102(a) as being anticipated by Yagangida (*“Polythiophene-sensitized TiO_2 solar cells”*).

As to claim 1, Yagangida teaches a pn—semiconductor material that can be obtained by the following steps:

- A step in which a substrate made of porous oxide ceramic (porous TiO_2 – section I, ¶ 3) is functionalized by chemical grafting of one or more compounds containing at least one group (COOH - section I, ¶ 3) that can be polymerized with one of more precursors of an electrically conducting

polymer (P3TAA-PHT - section I, ¶ 3) and at least one group able to be chemically grafted (covalent linkage - section I, ¶ 3) onto said substrate.

Yagangida is silent to a step in which the substrate thus functionalized being impregnated with a solution containing the precursor(s); and a step in which the precursor(s) are polymerized.

Zhao teaches a conventional chemical grafting method (grafting from) that requires the step of functionalizing the surface (I, initiators) and impregnating with a solution of precursors (M, monomers) which are then polymerized (Figure 9). Zhao teaches that the advantage of using 'grafting from' rather than the method taught by Ding (grafting to) is that there is an increasing in grafting density, as taught by Zhao (page 693, section 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the 'grafting from' method of Zhao in Ding because 'grafting from' decreases the amount of steric hindrance because the precursor (monomers) are smaller molecules than polymers and can readily reach the substrate to link.

Regarding claims 2 and 5, Yanagida teaches that the ceramic is TiO_2 (section 1, ¶ 3).

Regarding claim 3, Yanagida teaches that the porous oxide ceramic is mesoporous (section I, ¶ 3).

Regarding claim 6, Yanagida teaches that the group able to be chemically grafted onto the ceramic is $COOR^1$ where R^1 represents a hydrogen atom (carboxylic groups) (section 1, ¶ 3).

Regarding claim 7, Yanagida teaches that the group chosen $COOR^1$ where R^1 represents a hydrogen atom can be polymerized with precursors of an electrically conducting polymer chosen group thiophene (P3TAA-PHT) (section 1, ¶ 3). Examiner notes that the process by which the pn-semiconductor material is not germane to the final product, see claim analysis above for a complete discussion of product by process. Therefore the use of precursors is not a structural limitation because the final product in both cases is a polymer chemically grafted to a porous oxide ceramic.

Regarding claim 8, Yanagida teaches inclusion of chromophore(s) (polymer dyes - section 3, ¶ 3 and Table 6).

Regarding claim 9, Yanagida teaches that the porous oxide ceramic substrate is TiO_2 chemically grafted by thiophene-3-acetic acid (P3TAA, where the side methyl group serves as a second attachment site) to an alkylthiophene (PHT) (Figure 1). Examiner notes that because the step of functionalization and impregnation are notgermane to the structural limitations of the final product (alkylthiophene chemically grafted to TiO_2 via thiophene-3-acetic acid) the steps are not given patentable weight, see claim analysis for a complete discussion of product by process.

Regarding claim 11, Yanagida teaches a current collecting first electrode, a second electrode; and a semiconducting region as defined by claim 1 (section I, ¶ 3) between the first (Pt counter electrode) and second electrode (polymer coated electrode) (section 2.3, Figure 1).

6. Claims 3-4 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ding and Zhao as applied to claim 1 above, in view of Yanagida.

Applicant is directed to the paragraphs above for a complete discussion of Ding and Zhao.

Regarding claim 3, Ding does not specify that the nanoparticles are mesoporous.

Yanagida teaches mesoporous nanoparticles (section I, ¶ 3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the mesoporous nanoparticles of Yanagida in Ding because the optimum diameter value of pores that results from a compromise between increased surface area (more smaller pores) and large enough diameter to decrease steric hindrance effects during polymerization) is a result effective variable that involves only routine skill in the art.

Regarding claim 4, Ding teaches that the nanoparticles are mesostructured (network of porous nanoparticles) (section I, ¶ 2).

Regarding claim 11, Yanagida teaches a current collecting first electrode, a second electrode; and a semiconducting region as defined by claim 1 (section I, ¶ 3) between the first (Pt counter electrode) and second electrode (polymer coated electrode) (section 2.3, Figure 1).

7. Claims 3-4 and 11are rejected under 35 U.S.C. 103(a) as being unpatentable over Ding and Zhao as applied to claim 1 above, and further in view of O'regan (*A low cost, high efficiency solar cell based on dye sensitized colloidal TiO_2 films*).

Applicant is directed to the paragraphs above for a complete discussion of Ding and Zhao.

Regarding claim 3, modified Ding does not specify that the nanoparticles are mesoporous.

O'Regan teaches mesoporous (2-50nm) nanoparticles (page 738, ¶ 3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the mesoporous nanoparticles of O'Regan in Ding because the optimum diameter value of pores that results from a compromise between increased surface area (more smaller pores) and large enough diameter to decrease steric hindrance effects during polymerization) is a result effective variable that involves only routine skill in the art especially in light of the fact that the porous oxide films of O'Regan display exceptionally high efficiencies (abstract).

Regarding claim 4, Ding teaches that the nanoparticles are mesostructured (network of porous nanoparticles) (section I, ¶ 2).

Regarding claim 11, Yanagida teaches a current collecting first electrode, a second electrode; and a semiconducting region as defined by claim 1 (section I, ¶ 3) between the first (Pt counter electrode) and second electrode (polymer coated electrode) (section 2.3, Figure 1).

Response to Arguments

Applicant's arguments with respect to claims 1-9 and 11 have been considered but are moot in view of the new ground(s) of rejection as necessitated by amendment.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MIRIAM BERDICHEVSKY** whose telephone number is (571)270-5256. The examiner can normally be reached on M-Th, 10am-8pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. B./
Examiner, Art Unit 1795

/Alexa D. Neckel/
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